REMARKS

Claims in the case are 14-18, 24 and 25 upon entry of this amendment. Claims 14 and 15 have been amended, Claims 24 and 25 have been added, and Claim 23 has been cancelled without prejudice herein. Claims 19 and 20 were cancelled without prejudice in an amendment dated 10 January 2005. Claims 1-13, 21 and 22 were cancelled without prejudice in previous amendments.

Basis for added Claim 24 is found at page 3, line 22 through page 4, line 2 of the specification. Basis for added Claim 25 is found at page 3, lines 16-20 and 26-27 of the specification.

Claim 14 has been amended to delete recitations as to components (c) and (d), and for purposes of improved clarity, in particular with regard to the wherein clause thereof. Basis for including the recitation of rare earth metal oxides in sintering aid (a) of Claim 14 is found in Claim 2 and at page 3, lines 5-7 of the specification. Basis for the inclusion of the porosity of the silicon nitride material in Claim 14 is found in Claim 23, and at page 4, line 4 of the specification.

Claims 14-18 and 23 stand rejected under 35 U.S.C. § 112, first paragraph. This rejection is respectfully traversed with regard to the amendments herein and the following remarks.

Claim 14 has been amended herein to remove recitations as to the silicon nitride material containing the reactive additives TiO_2, WO_3 and MoO_3.

In light of the amendments herein and the preceding remarks Applicants' claims are deemed to be fully supported by the specification and to be in compliance with 35 U.S.C. § 112, first paragraph. Reconsideration and withdrawal of the present rejection is respectfully requested.

In the previous Office Action dated 20 October 2004, Claims 14-20 and 23 stood rejected under 35 U.S.C. §103(a) as being unpatentable over United States Patent No. 5,508,241 (**Yeckley**) further in view of United States Patent No. 5,439,856 (**Komatsu**). Applicants wish to address this prior rejection in light of the Examiner's comments (on page 3 of the Office Action of 17 February 2005) regarding possible reinstatement of this rejection upon amendment of the claims to overcome the 35 U.S.C. § 112, first paragraph rejection herein.

Yeckley discloses a sintered silicon nitride that is prepared using sintering aids MgO and alumina. The sintered silicon of Yeckley may also include silicon in the grain boundary phase. See the abstract, and column 2, lines 3-20 of Yeckley.

Komatsu discloses a high thermal conductive silicon nitride sintered body that contains: 2.0 to 7.5 wt.% of an oxide of a rare earth element; at most 0.3 wt.% of impurity cationic elements, such as Li; at most 2.0 wt.% of alumina and/or alumina nitride; and optionally 0.2 to 3.0 wt.% oxides, carbides, nitrides, silicides and borides of at least one of Ti, Zr, Hf, V, Nb, Ta, Cr, Mo and W. In addition, the sintered body of Komatsu includes: (i) a beta-phase type silicon nitride crystal; and (ii) a grain boundary phase. See the abstract of Komatsu.

Yeckley provides no disclosure, teaching or suggestion as to his sintered silicon nitride containing a beta-phase type silicon nitride crystal. In fact, Yeckley only discloses the use of alpha silicon nitride. See column 2, line 47 and the examples of Yeckley. In addition, Yeckley provides no disclosure, teaching or suggestion with regard to including oxides of rare earth elements in his sintered silicon nitride.

The high thermal conductive silicon nitride sintered body of Komatsu is disclosed as necessarily including a beta-phase type silicon nitride crystal. In addition, the high thermal conductive silicon nitride sintered body of Komatsu is disclosed as necessarily including oxides of rare earth elements.

As such, neither Yeckley nor Komatsu provide the requisite disclosure that would motivate a skilled artisan to combine and/or modify their respective disclosures to arrive at Applicants' presently claimed silicon nitride material. As the Court of Appeals for the Federal Circuit has stated, there are three possible sources for motivation to combine references in a manner that would render claims obvious. These are: (1) the nature of the problem to be solved; (2) the teaching of the prior art; and (3) the knowledge of persons of ordinary skill in the art. *In re Rouffet*, 47 U.S.P.Q.2d 1453, 1458 (Fed. Cir. 1998). The nature of the problem to be solved and the knowledge of persons of ordinary skill in the art are not present here and have not been relied upon in the rejection. As for the teaching of the prior art, the above discussion has established that neither of the patents relied upon in the

rejection provides the requisite teaching, and certainly do not provide the motivation or suggestion to combine that is required by Court decisions.

The rejection appears to impermissibly use Applicants' application as a blueprint for selecting and combining or modifying the cited references to arrive at Applicants' claimed invention, thereby making use of prohibited hindsight in the selection and application of the cited references. The use of hindsight reconstruction of an invention is an inappropriate process by which to determine patentability. *In re Rouffet*, 47 U.S.P.Q.2d 1453, 1457 (Fed. Cir. 1998). Modifying "prior art references without evidence of such a suggestion, teaching or motivation simply takes the inventor's disclosure as a blueprint for piecing together the prior art to defeat patentability -- the essence of hindsight." *In re Dembiczak*, 175 F.3d 994, 999 (Fed. Cir. 1999).

Even if Yeckley and Komatsu were combined, Applicants' presently claimed silicon nitride material would not result from such combination. Yeckley disclose the necessary presence of Mg (and in particular MgO) in the single grain boundary region of his sintered silicon nitride ceramic. The silicon nitride of Applicants' present claims includes a grain boundary phase that is exclusive of Mg. Komatsu does not disclose, teach or suggest the presence of silicon dioxide in their high thermal conductive silicon nitride sintered bodies. The silicon nitride of Applicants' present claims necessarily includes silicon dioxide in the grain boundary phase thereof.

Yeckley and Komatsu, either alone or in combination, do not disclose, teach or suggest a sintered silicon nitride material that includes a grain boundary phase that consists of rare earth metal oxides (such as Y_2O_2 and/or Sc_2O_3) and/or Al_2O_3, and silicon dioxide. In addition, Yeckley and Komatsu, either alone or in combination, do not disclose, teach or suggest a sintered silicon nitride material that includes a grain boundary phase that consists of rare earth metal oxides (such as Y_2O_2 and/or Sc_2O_3) and/or Al_2O_3, and silicon dioxide, in which the silicon dioxide and the sintering aid in the grain boundary phase have a molar ratio of (silicon dioxide) to (silicon dioxide and sintering aid) that is greater then 65%.

Applicants wish to direct attention to the examples summarized in Table 1 on page 9 of the specification, which demonstrate the unexpectedly improved corrosion

resistance that is provided by the silicon nitride materials according to their present claims. In particular, attention is directed to Examples 2a (comparative) and 2b (according to the invention). The silicon nitride material of Example 2a has a ratio of SiO_2 to (SiO_2 + sintering additives) in the grain boundary phase of 30 percent, and the silicon nitride material of Example 2b has a ratio of SiO_2 to (SiO_2 + sintering additives) in the grain boundary phase of 74 percent. The corrosion resistance of Example 2b is greatly improved relative to that of Example 2a, as represented, for example, by the smaller $\Delta m(100h)$ values (0.2 vs. 10) and smaller $\Delta m(500h)$ values (0.2 vs. 16) for Example 2b. In addition, silicon nitride materials according to Applicants' present claims have improved strength. For example, the silicon nitride material of Example 2b (according to the invention) has a strength value $\sigma 4b$ of 750 MPa, while that of Example 2a (comparative) has a strength value $\sigma 4b$ of 450 MPa. Yeckley and Komatsu, either alone or in combination, do not disclose, teach or suggest selecting the ratio of SiO_2 to (SiO_2 + sintering additives) in the grain boundary phase of a silicon nitride material, such that the silicon nitride material will have unexpectedly improved physical properties, such as improved corrosion resistance and strength.

In light of the amendments herein and the preceding remarks, Applicants' claims are deemed to be unobvious and patentable over Yeckley in view of Komatsu. Reconsideration and withdrawal of the present rejection is respectfully requested.

In the previous Office Action dated 20 October 2004, Claims 14-19 and 23 stood rejected under 35 U.S.C. §103(a) as being unpatentable over Yeckley further in view of one of United States Patent No. 4,826,791 (**Mehrotra et al**) or United States Patent No. 5,523,268 (**Ukyo et al**). Applicants wish to address this prior rejection in light of the Examiner's comments (on page 3 of the Office Action of 17 February 2005) regarding possible reinstatement of this rejection upon amendment of the claims to overcome the 35 U.S.C. § 112, first paragraph rejection herein.

Yeckley has been discussed previously herein, and discloses a sintered silicon nitride that is prepared using sintering aids MgO and alumina. The sintered silicon of Yeckley may also include silicon in the grain boundary phase.

Mehrotra et al disclose a ceramic composite that includes: a ceramic matrix of alpha prime and beta prime sialon; and silicon carbide particles dispersed in the ceramic matrix. See the abstract, and column 2, lines 19-29 of Mehrotra et al.

Ukyo et al disclose a sintered silicon nitride body that includes: silicon carbide dispersed in silicon nitride; and boron and/or boron compounds. The boron / boron compounds are disclosed by Ukyo et al as being necessarily present for purposes of improving the high temperature properties of their sintered body (e.g., creep resistance). See the abstract, and column 2, lines 35-51 of Ukyo et al.

Yeckley disclose the necessary presence of Mg (and in particular MgO) in the single grain boundary region of his sintered silicon nitride ceramic. Mehrotra et al provide no disclosure or suggestion as to the presence of Mg or MgO in their ceramic composite. As such, neither Yeckley nor Mehrotra et al provide the requisite disclosure that would motivate a skilled artisan to combine or otherwise modify their respective disclosures to arrive at Applicants' presently claimed silicon nitride material.

Yeckley provides no disclosure or suggestion as to the inclusion of boron and/or boron compounds in his sintered silicon nitride ceramic. Ukyo et al disclose and teach the necessary presence of boron and/or boron compounds in their sintered silicon nitride bodies, for purposes of improving the high temperature properties thereof. As such, neither Yeckley nor Ukyo et al provide the requisite disclosure that would motivate a skilled artisan to combine or otherwise modify their respective disclosures to arrive at Applicants' presently claimed silicon nitride material.

The combination of Yeckley and Mehrotra et al, and the combination of Yeckley and Ukyo et al appears to make impermissible use of hindsight reconstruction by picking, choosing and discarding certain elements of their respective disclosures in an attempt to arrive at Applicants' presently claimed silicon nitride material.

Yeckley, Mehrotra et al and Ukyo et al, either alone or in combination, do not disclose, teach or suggest a sintered silicon nitride material that includes a grain boundary phase that consists of rare earth metal oxides (such as Y_2O_2 and/or Sc_2O_3) and/or Al_2O_3, and silicon dioxide. In addition, Yeckley, Mehrotra et al and

Ukyo et al, either alone or in combination, do not disclose, teach or suggest a sintered silicon nitride material that includes a grain boundary phase that consists of rare earth metal oxides (such as Y_2O_2 and/or Sc_2O_3) and/or Al_2O_3, and silicon dioxide, in which the silicon dioxide and the sintering aid in the grain boundary phase have a molar ratio of (silicon dioxide) to (silicon dioxide and sintering aid) that is greater then 65%.

Applicants wish to direct attention to the examples summarized in Table 1 on page 9 of the specification, which demonstrate the unexpectedly improved corrosion resistance that is provided by the silicon nitride materials according to their present claims. In particular, attention is directed to Examples 2a (comparative) and 2b (according to the invention). The silicon nitride material of Example 2a has a ratio of SiO_2 to (SiO_2 + sintering additives) in the grain boundary phase of 30 percent, and the silicon nitride material of Example 2b has a ratio of SiO_2 to (SiO_2 + sintering additives) in the grain boundary phase of 74 percent. The corrosion resistance of Example 2b is greatly improved relative to that of Example 2a, as represented, for example, by the smaller $\Delta m(100h)$ values (0.2 vs. 10) and smaller $\Delta m(500h)$ values (0.2 vs. 16) for Example 2b. In addition, silicon nitride materials according to Applicants' present claims have improved strength. For example, the silicon nitride material of Example 2b (according to the invention) has a strength value $\sigma 4b$ of 750 MPa, while that of Example 2a (comparative) has a strength value $\sigma 4b$ of 450 MPa. Yeckley, Mehrotra et al and Ukyo et al, either alone or in combination, do not disclose, teach or suggest selecting the ratio of SiO_2 to (SiO_2 + sintering additives) in the grain boundary phase of a silicon nitride material, such that the silicon nitride material will have unexpectedly improved physical properties, such as improved corrosion resistance and strength.

In light of the amendments herein and the preceding remarks, Applicants' present claims are deemed to be unobvious and patentable over Yeckley in view of one of Mehrotra et al or Ukyo et al. Reconsideration and withdrawal of the present rejection is respectfully requested.

In light of the amendments herein and the preceding remarks, Applicants' presently pending claims are deemed to meet all the requirements of 35 U.S.C. §112, and to define an invention that is unanticipated, unovbious and hence, patentable. Reconsideration of the rejections and allowance of all of the presently pending claims is respectfully requested.

Respectfully submitted,

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